minimum temperatures were the lowest on record at: Denver, 43; Vineyard Haven and Amarillo, 52; Augusta, 58; Savannah, 61; Jacksonville, 64; Tampa, 66.

The greatest daily range of temperature and data for computing the extreme and mean monthly ranges are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: Williston, Miles City, and Idaho Falls, 48; Bismarck and Huron, 47; Moorhead and Carson City, 46; Rapid City, 45. The smallest values were: Hatteras, 14; Block Island, Woods Hole, Jupiter, Point Reyes Light, and Eureka, 17; Nantucket, Key West, Port Eads, Corpus Christi, and San Francisco, 18.

Among the *extreme monthly ranges* the largest were: Huron, 61; Moorhead, 60; Bismarck, 58; Pierre and Sioux City, 57; Williston and La Crosse, 56. The smallest values were: Key West, 19; Point Reyes Light and San Francisco, 20; Eureka, 21; Corpus Christi and Jupiter, 22; Port Eads, 23; Hatteras, Galveston, and Tatoosh Island, 24.

The *accumulated monthly departures* from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average accumulated departures are given in the third column for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
New England	+ 0.5	+ 0.1	Florida Peninsula	−11.4	− 1.4
Middle Atlantic	+ 4.8	+ 0.6			
South Atlantic	+10.2	+ 1.3			
East Gulf	+ 1.7	+ 0.2			
West Gulf	+11.3	+ 1.4			
Ohio Valley and Tenn	+11.2	+ 1.4			
Lower Lake	+11.3	+ 1.4			
Upper Lake	+23.1	+ 2.9			
North Dakota	+ 7.4	+ 0.9			
Upper Mississippi	+21.9	+ 2.7			
Missouri Valley	+21.4	+ 2.7			
Northern Slope	+ 9.4	+ 1.2			
Middle Slope	+25.0	+ 3.1			
Abilene (southern Slope)	+24.7	+ 3.1			
Southern Plateau	+ 5.5	+ 0.7			
Middle Plateau	+ 1.8	+ 0.2			
Northern Plateau	+15.9	+ 2.0			
North Pacific	+ 2.6	+ 0.3			
Middle Pacific	+ 1.6	+ 0.2			
South Pacific	+ 5.0	+ 0.6			

MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-points for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, are given in Table I.

The *rate of evaporation* from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer, but a properly constructed evaporometer may be made to give the *quantity* of water evaporated from a similar surface during any interval of time. Such an evaporometer, therefore, would sum up or integrate the effects of those influences that determine the temperature as given by the wet bulb; from this quantity the *average humidity of the air* during any given interval of time may be deduced.

Measurements of evaporation within the thermometer shelters are difficult to make so as to be intercomparable at temperatures above and below freezing, and may be replaced by computations based on the wet-bulb temperatures. The absolute amount of evaporation from natural surfaces not protected from wind, rain, sunshine, and radiation, are being made at a few experimental stations and will be discussed in special contributions.

Sensible temperatures.—The sensation of temperature experienced by the human body and ordinarily attributed to the condition of the atmosphere depends not merely on the temperature of the air, but also on its dryness, on the velocity of the wind, and on the suddenness of atmospheric changes, all combined with the physiological condition of the observer. A complete expression for the relation between atmospheric conditions and nervous sensations has not yet been obtained.

PRECIPITATION.

[In inches and hundredths.]

The *distribution of precipitation* for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III. The total precipitation for the current month was heaviest, 6 to 11 inches, in the northern portion of the Florida Peninsula, and nearly as heavy in a portion of western Indiana and northeastern Kansas. It was less than 0.5 in central Montana, central Idaho, central Washington and Oregon, and nearly all of California and Nevada.

Details as to *excessive precipitation* are given in Tables XII and XIII.

The *diurnal variation*, as shown by tables of hourly means of the total precipitation, deduced from self-registering gauges kept at the regular stations of the Weather Bureau, is not now tabulated.

The *current departures* from the normal precipitation are given in Table I, which shows that precipitation was in excess in the lower Lake Region and St. Lawrence Valley, the Plateau Region and Pacific Coast, portions of Iowa and adjacent States. Elsewhere it was deficient, and especially in the Atlantic and Gulf States. The large excesses were: Alpena, 3.3; Montreal, 3.2; Meridian, 2.6; Port Huron, 2.2. The large deficits were: Galveston, 5.2; Wilmington, 5.0; Hatteras, 4.9; Chattanooga, 4.3; Kittyhawk, 4.2; Norfolk, 4.1.

The total accumulated monthly departures from normal precipitation from January 1 to the end of the current month are given in the second column of the following table; the third column gives the ratio of the current accumulated precipitation to its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
Lower Lake	+ 2.50	110	New England	− 5.00	83
North Dakota	+ 1.10	107	Middle Atlantic	− 2.80	91
Upper Mississippi	+ 0.80	103	South Atlantic	− 7.30	81
Southern Plateau	+ 0.30	105	Florida Peninsula	− 0.20	99
Middle Plateau	+ 3.10	138	East Gulf	− 7.00	83
Northern Plateau	+ 0.10	101	West Gulf	− 9.70	67
North Pacific	+ 4.60	113	Ohio Valley and Tenn	− 3.50	89
Middle Pacific	+ 2.80	115	Upper Lakes	− 2.20	90
			Missouri Valley	− 0.20	99
			Northern Slope	− 0.10	99
			Middle Slope	− 2.50	86
			Abilene (southern Slope)	− 6.20	66
			South Pacific	− 1.90	77

The *average departure* for each district is given in Table I. By dividing each by its respective normal the following corresponding percentages are obtained (precipitation is in excess when the percentage of the normal exceeds 100):

Above the normal: Lower Lake, 113; upper Lake, 114; middle Plateau, 446; northern Plateau, 433; north Pacific, 141; middle Pacific, 282.

Normal: South Pacific, 100.

Below the normal: New England, 60; middle Atlantic, 42; south Atlantic, 51; Florida Peninsula, 74; east Gulf, 64; west Gulf, 36; Ohio Valley and Tennessee, 81; North Da-

kota, 84; upper Mississippi, 94; Missouri Valley, 74; northern Slope, 77; middle Slope, 55; southern Slope (Abilene), 39; southern Plateau, 85.

The years of greatest and least precipitation for August are given in the REVIEW for August, 1890. The precipitation for the current month was the greatest on record at: Meridian, 6.39; Spokane, 1.48; Carson City, 1.30; Walla Walla, 1.24; Winnemucca and Eureka, 0.70; Red Bluff, 0.54; Sacramento, 0.20; Fresno, 0.15; San Francisco, 0.09. It was the least on record at: Wilmington, 2.48; Columbia, 2.38; Atlanta, 1.97; Chattanooga, 1.90; Harrisburg, 1.45; Fort Smith, 1.31; Knoxville, 1.25; Charlotte, 1.05; Philadelphia, 0.46; Galveston, 0.35.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 13; Arizona, 4, 15, 16, 17, 20, 23, 24, 25. Arkansas, 10, 22. California, 16, 30. Colorado, 5, 11, 13, 18, 19, 21 to 24, 30. Connecticut, 14, 19. Delaware, 13. Georgia, 11, 14. Idaho, 3, 20, 21. Illinois, 5, 11, 13, 15, 22, 23. Indiana, 1, 5, 6, 7, 15, 22, 23. Iowa, 4, 5, 9, 13, 14, 15, 21, 26. Kansas, 9, 21, 22, 25. Kentucky, 1, 12, 13. Louisiana, 18. Maine, 18. Massachusetts, 15, 18, 19. Michigan, 1, 4, 5, 8 to 11, 14, 15, 25, 26, 29. Minnesota, 1 to 4, 6, 7, 8, 10, 13 to 16. Missouri, 8, 9, 13, 22. Montana, 1, 6, 7, 8, 16. Nebraska, 4, 6, 10, 13 to 16, 30. Nevada, 16, 18, 19, 20, 23, 28. New Hampshire, 18, 19. New Jersey, 13, 18. New Mexico, 31. New York, 9, 12, 18. North Carolina, 3, 13. North Dakota, 2, 3, 5 to 8, 14, 19. Ohio, 1, 9, 10, 15, 22, 23. Oregon, 27. Pennsylvania, 16, 18. Rhode Island, 19. South Dakota, 7, 8, 10, 13, 19, 20. Texas, 16, 25. Utah, 16, 21, 22. Vermont, 18. Virginia, 13, 15. Washington, 27. Wisconsin, 4, 5, 9, 25.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 18 regular stations of the Weather Bureau by its photographic, and at 24 by its thermal effects. At one station records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric sheets show seventy-fifth meridian time; for convenience the results are all given in Table XI for each hour of local mean time.

Photographic and thermometric registers give the duration of that intensity of sunshine which suffices to make a record, and, therefore, they generally fail to record for a short time after sunrise and before sunset, because, even in a cloudless sky, the solar rays are then too feeble to affect the self-registers. If, therefore, such records are to be used for determining the amount of cloudiness, they must be supplemented by special observations of the sky near the sun at these times. The duration of clear sky thus specially determined constitutes the so-called twilight correction (more properly a low-sun correction), and when this has been applied, as has been done in preparing Table XI, there results a complete record of the clearness of the sky from sunrise to sunset in the neighborhood of the sun. The twilight correction is not needed when the self-registers are used for ascertaining the duration of a special intensity of sunshine, but is necessary when the duration of cloudiness is alone desired, as is usually the case.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table XI.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the duration relative to possible sunshine is derived; the observer's personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for August, 1896, is 8 per cent photographic and 10 per cent for thermometric records.

The details are shown in the following table, in which the stations are arranged according to the greatest possible duration of sunshine, and not according to the *observed* duration as heretofore.

Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
		Hrs.	%	%	%	%	%
Bismarck, N. Dak.	P.	440.0	65	75	+10	.....	.....
Helena, Mont.	P.	440.0	64	71	+ 7	.....	.....
Portland, Oreg.*	T.	437.6	54	.....	.....	43	−11
	P.	437.6	54	44	−10	.....	.....
Eastport, Me.	P.	435.6	39	52	+13	.....	.....
Minneapolis, Minn	T.	435.6	.....	.....	.....	71	.....
Northfield, Vt	P.	433.6	45	60	+15	.....	.....
Portland, Me	T.	433.6	42	.....	.....	61	+19
Buffalo, N. Y	T.	431.3	38	.....	.....	71	+33
Rochester, N. Y	T.	431.3	57	.....	.....	62	+ 5
Boston, Mass	T.	429.4	54	.....	.....	61	+ 7
Chicago, Ill	T.	429.4	69	.....	.....	82	+13
Cleveland, Ohio	P.	429.4	53	64	+11	.....	.....
Des Moines, Iowa	T.	429.4	55	.....	.....	62	+ 7
Dubuque, Iowa†	T.	.....	.....	.....	.....	.....	.....
Detroit, Mich.	T.	429.4	53	.....	.....	68	+15
Eureka, Cal.	P.	427.4	36	27	− 9	.....	.....
New York, N. Y.	T.	427.4	61	.....	.....	59	− 2
Omaha, Nebr	P.	427.4	52	62	+10	.....	.....
Salt Lake City, Utah	P.	427.4	54	77	+23	.....	.....
Columbus, Ohio	T.	425.2	45	.....	.....	55	+10
Denver, Colo.	P.	425.2	56	63	+ 7	.....	.....
Philadelphia, Pa.	T.	425.2	55	.....	.....	82	+27
Baltimore, Md.	T.	423.2	60	.....	.....	64	+ 4
Cincinnati, Ohio	T.	423.2	64	.....	.....	83	+19
Kansas City, Mo.	P.	423.2	68	72	+ 4	.....	.....
St. Louis, Mo	T.	423.2	69	.....	.....	81	+12
Washington, D. C.	P.	423.2	69	74	+ 5	.....	.....
Dodge City, Kans.	P.	422.1	70	78	+ 8	.....	.....
Louisville, Ky	T.	422.1	73	.....	.....	85	+12
San Francisco, Cal.	T.	422.1	55	.....	.....	65	+10
Fresno, Cal.	T.	420.1	83	.....	.....	87	+ 4
Santa Fe, N. Mex.	P.	418.7	52	71	+19	.....	.....
Little Rock, Ark.	T.	417.1	63	.....	.....	84	+21
Wilmington, N. C.	T.	415.8	57	.....	.....	69	+12
Atlanta, Ga†	T.	.....	.....	.....	.....	.....	.....
Phœnix, Ariz.	P.	414.0	60	85	+25	.....	.....
San Diego, Cal.	P.	414.0	82	71	−11	.....	.....
Savannah, Ga.	P.	412.6	61	67	+ 6	.....	.....
Vicksburg, Miss	T.	412.6	70	.....	.....	76	+ 6
New Orleans, La.	T.	409.7	62	.....	.....	63	+ 1
Galveston, Tex.	P.	408.0	72	80	+ 8	.....	.....

*Record by both methods. †Record incomplete.

WIND.

The *prevailing winds* for August, 1896, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assump-